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ABSTRACT

This study focused on the processes occurring during the waiting period in delay of gratification situations. Sixty-four middle class preschool children chose between waiting for a preferred item and receiving a less desired item immediately. The items were of different classes, i. e., one food and one toy, and subjects waited with one, both, or neither of the rewards available for viewing. The pattern of subjects' delay times was incompatible with the predictions of two current theories of delay of gratification processes, an aversive affect model implied by Mischel and Ebbesen (1970) and Atkinson and Birch's dynamics of action (1970). Although display of rewards impaired successful delay, replicating previous results, dynamics of action predictions of differential effects for display of immediately available and delayed outcomes of different classes were not confirmed. Contradicting a prediction based on the aversive affect model, subjects' likelihoods of continued waiting did not decrease as a function of previous waiting time. Systematic observation of spontaneous subject activities during the delay period offered support for the notion that distraction facilitates successful waiting behavior. Overall, results were consistent with a proposed generalization of decision theoretical models of delay behavior which conceives of the waiting period as a series of decision-making opportunities in which successive reappraisals of the time vs value tradeoff are made. (Author/CM)

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PROCESSES OPERATIVE DURING DELAY OF GRATIFICATION

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Running head: Processes Operative During Delay

This is a revision of a paper presented at the biennial meeting of the Society for Research in Child Development, New Orleans, March 1977.

Abstract

Sixty-four middle class, preschool children chose between waiting for a preferred item and receiving a less desired item immediately. The items were of different classes, i.e., one food and one toy, and subjects waited with one, both, or neither of the rewards available for viewing. The pattern of subjects' delay times was incompatible with the predictions of two current theories of delay of gratification processes, an aversive affect model implied by Mischel and Ebbesen (1970) and Atkinson and Birch's dynamics of action (1970). Although display of rewards impaired successful delay, replicating previous results, dynamics of action predictions of differential effects for display of immediately available and delayed outcomes of different classes were not confirmed. Contradicting a prediction based on the aversive affect model, subjects' likelihoods of continued waiting did not decrease as a function of previous waiting time. Systematic observation of spontaneous subject activities during the delay period offered support for the notion that distraction facilitates successful waiting behavior. Overall, results were consistent with a proposed generalization of decision theoretical models of delay behavior.

PROCESSES OPERATIVE DURING DELAY OF GRATIFICATION

In any delay of gratification situation, a person must choose between waiting for a delayed attractive outcome and taking a less attractive outcome which is available immediately. It has been suggested by Mischel (1974b) and others that there are actually two components to this decision process. First, the person must choose whether or not to begin waiting for the preferred alternative. If he/she chooses to do so, he/she must then sustain that choice throughout the required waiting period. This study was designed to examine what happens during the second phase in the delay of gratification process--the psychological mechanisms operative during the period of time after the decision to wait has been made but before the preferred reward becomes available.

Based on the results of a series of studies (Mischel & Baker, 1975; Mischel & Ebbesen, 1970; Mischel, Ebbesen, & Zeiss, 1972; Mischel & Moore, 1973; Mischel & Underwood, 1974), Mischel and his colleagues have proposed the currently dominant theory of processes operative during delay. Mischel's model is based on the premise that waiting for a desired outcome induces unpleasant frustration affect. Specifically, this aversive affect results from: (1) the person's inability to obtain the preferred outcome immediately, (2) the conflict implicit in the choice situation, and (3) the mere activity of waiting. In addition to postulating the existence of frustration affect, Mischel asserts further that the strength of such affect is the governing factor in delay behavior. If the affect becomes too intense

during the waiting period, the person will terminate his/her wait by taking the less attractive, immediately available item simply to escape from the situation and end the unpleasant feelings. Thus, any activity during the waiting period which increases frustration affect should tend to decrease waiting times, whereas activities which decrease the aversive affect should facilitate waiting. To test this hypothesis, the Mischel group has manipulated the subject's attention to and thoughts about the outcomes in a delay situation. The prediction that increased exposure to and thought about the outcomes should lead to decreased waiting times has been confirmed experimentally (Mischel & Ebbesen, 1970; Mischel, Ebbesen, & Zeiss, 1972).

The role of aversive affect in the entire process, however, has simply been inferred rather than investigated directly. Since reminders of the choice to be made have led to decreased delay times, it has been assumed that the intervening variable is increased frustration affect. The affect itself and its effects on behavior have been accepted without direct evidence. There have been some recent investigations concerning the relationship of affect to delay of gratification (Moore, Clyburn, & Underwood, 1976; Schwarz & Pollack, 1977); however, these studies have focused on the effect of the subject's affective state on his/her initial choice in a delay paradigm, not the processes sustaining a delay once it has been chosen. The results of Mischel's most direct test of the effects of aversive affect, in fact, contradict the predictions of the model (Mischel, Ebbesen, & Zeiss, 1972). Children who were instructed to "think sad thoughts" during the delay period, presumably creating additional negative affect, did not

terminate their waiting any sooner than children instructed to think about the rewards or children who were given no instruction concerning their thoughts during the delay period. In each of these conditions subjects waited with both rewards present, so the base level of frustration affect should have been equivalent across the groups. The additional negative affect induced in the "think sad" group, then, did not increase the tendencies of the subjects in that group to terminate the delay period as would be expected if aversive affect were the governing factor in delay behavior. Since the very existence of unpleasant affect during the waiting period and its instrumental role in delay processes form the foundation of Mischel's theory, these factors require a more direct substantiation than has previously been offered.

One implication which is warranted by the central role of affect in the model may be tested directly. The activity of waiting itself, especially when combined with thoughts about the outcomes, leads to increased aversive affect. Therefore, it follows that the longer a person waits, the higher his/her aversive affect level becomes. More waiting behavior induces more aversive affect, which in turn increases the likelihood that the person will terminate his/her waiting in order to eliminate the unpleasant feelings. Since the level of aversive affect is the determining factor in delay behavior and since this level increases as the person continues to wait, the model predicts that the longer a person has already waited for a delayed outcome, the less likely he/she should be at any particular moment to continue waiting. To test this implication of Mischel's model, we presented subjects

with a delay of gratification situation and examined the pattern of waiting times across subjects to determine whether or not the likelihood of continued delay decreases as a function of previous waiting time.

As an alternative to Mischel's explanation of delay processes, Birch and Atkinson (1974) have applied their general theory of motivation, "the dynamics of action" (Atkinson & Birch, 1970), to behavior in delay situations. Although their theoretical basis for the prediction is very different from that of Mischel, Birch and Atkinson also imply that a person's tendency to wait should decrease with time. Within the dynamics of action framework, the behavior which occurs at any given time depends on the relative strengths of tendencies to engage in each of the possible behaviors available to the person; i.e., whichever tendency is strongest at a particular point in time will determine the person's behavior at that moment. During the waiting period in a delay of gratification situation there are two possible behaviors--waiting or terminating the delay period by accepting the less attractive outcome. As a result of principles specified by the dynamics of action, the tendency to wait decreases with time while the tendency to terminate the waiting period increases or remains constant. A person will continue to delay only as long as his/her tendency to wait remains higher than his/her tendency to terminate the session, and this relationship becomes less likely as the waiting period progresses.

Although the aversive affect model and the dynamics of action have similar implications concerning the effects of previous waiting time on continued waiting behavior, their predictions diverge regarding the effects

of exposing the subject to either or both of the outcomes during the waiting period. The findings of studies manipulating outcome display (see Mischel & Ebbesen, 1970, for example) generally indicate that subjects waiting in the presence of one or both outcomes do not delay as long as subjects who wait with neither outcome present. This result is congruent with the predictions of Mischel's model, which proposes that the display of either outcome should lead to frustration affect and therefore shortened waiting times. The model also specifies that the intensity of affect should be greatest (and thus waiting times shortest) when both the delayed and immediately available outcomes are displayed. This prediction, however, has not been supported by experimental evidence.

Birch and Atkinson (1974) predict a different set of display effects. According to the dynamics of action, the outcome which is displayed increases the subject's tendency to take that item. So, waiting times should be shortest when only the immediately available object is present, since the subject's tendency to take that item (terminating the session) is increased. Birch and Atkinson suggest that Mischel's typical display effects, which do not conform to this pattern, are an artifact of the situation in which both outcomes are of the same class (e.g., both food), as they have been in Mischel's studies. The way in which the use of two outcomes from the same class confounds display effects can be illustrated as follows. Suppose a child is offered a choice between a pretzel now and a marshmallow, which he/she prefers, later. If the child becomes hungry while waiting for and thinking about the marshmallow, he/she can satisfy his/her hunger at least

partially by taking the immediately available pretzel. This logic applies even more directly to cases in which the delayed reward is simply a larger quantity of the immediately available outcome, e.g., two pretzels vs. one pretzel. So, in this case displaying any of the rewards increases the subject's tendency to take the immediately available one. If the outcomes were of different classes, however, display of one outcome would affect only the tendency to take that outcome, and differential effects would be expected for the display of the immediate reward as opposed to the delayed reward. Display of the immediately available, less attractive outcome should increase the tendency to terminate the session. On the other hand, display of the delayed preferred reward should produce essentially the same waiting behavior as the condition in which nothing is displayed. To test this distinction, we offered subjects immediate and deferred rewards of two different classes, food and toys.

Since the focus of this study was on processes occurring during the waiting period in delay situations, we also observed the behaviors of subjects during that period. Casual observations of subjects' waiting period activities have been reported by Mischel (1974a, for example). The present study simply included a more detailed and systematic procedure for observing and recording subjects' spontaneous activities while waiting. These observations provide an additional source of evidence regarding the status of current theories, an opportunity to determine the types of behavior which are associated with successful delay, and the possibility of suggesting new waiting strategies which have not been included in current theories of delay behavior.

Method

Subjects

Subjects in this study were middle-class children from two private preschools. There are two reasons why preschool children were chosen to be the subjects in this study. First, small units of time are more salient to young children than to adults, so it is more feasible to offer a meaningful delay choice to this group within an experimental paradigm. Second, we were interested in testing predictions arising from Mischel's model and making comparisons with the results of his studies, in which he has used preschool subjects. There were 64 subjects in this study, and an additional six subjects were dropped due to refusal to come for the second session or failure to understand the instructions. Ages ranged from 38.5 to 69 months, with a mean age of 53.5 months. There were equal numbers of males and females in each of the four conditions, and mean age was equated across conditions. The two experimenters were both female; one conducted the preliminary session for each child and the other conducted the experimental session.

Preliminary Session

In order to select the items to be offered to a given child in the delay situation, a preliminary session was conducted to determine his/her preferences among the available items. Each subject was told that he/she would be shown a variety of things in order to determine which ones he/she liked best. First, all of the items (a finger puppet, a whistle, a party favor blow-out, a small box of raisins, several marshmallows, and several animal crackers) were

presented. Each item was named, and the toys were demonstrated; then all fifteen of the possible pairings of the six items were presented in a standard, random order, with left/right position randomized. For each pair of items, the subject was asked to point to the item he/she "liked best." After completing the fifteen choices, the subject was told that there would be another session the following day.

Based on the individual child's preferences, one food item and one toy were chosen to be offered to that child in the experimental session. Using X to represent the preferred item for which the child had to wait and Y to represent the less preferred item which the child was allowed to have immediately, the items to be used were determined according to the following criteria: (1) Item X and Item Y were of different classes (one food and one toy); (2) Item X was preferred to Item Y in the direct pairing of these two items; (3) At least one other item (of either class) was preferred to Item X; Item Y was preferred to at least one other item (of either class); (4) The difference between the number of items to which Item X was preferred was maximal, given the other criteria. Restrictions 3 and 4 were included to insure a moderate discrepancy in the subject's preference of Item X over Item Y. The preferred item was food for half of the subjects in each condition and a toy for the other half.

Experimental Session

In order to equate the subject's hunger level in the preliminary and experimental sessions as closely as possible, each subject's sessions were scheduled at the same time of day on two consecutive days. For the delay

session, subjects were taken to a small room in an experimental trailer. In the room there were a table and one chair, a fan blocked from view by a partition, one window covered with blinds, and two one-way mirrors. The child was seated at the table, facing a wall. After talking to the child for several moments to help him/her become comfortable in the room, the experimenter initiated a game with the child to teach him/her a knocking procedure for signaling the experimenter to return from an adjacent room. She told the child:

> I'm going to go into the next room and close the door. After I have left, I want you to knock on the table two times like this (demonstrates). When you knock on the table two times I will come right back! Okay?

This procedure was repeated several times, until the child understood that he/she could "bring the experimenter back" by knocking.

The experimenter then presented the child's preferred and less preferred items and asked the subject which one he/she wanted, to confirm his/her preference from the previous day. If the child switched his/her preference, which rarely happened, the remainder of the session was conducted on the basis of the newly declared preference. From this point, the procedure described by Mischel and Ebbesen (1970) was followed. The experimenter told the child that she was going to leave the room, and that if the child waited for her to come back he/she could have his/her preferred reward. The child was told that if he/she didn't want to wait he/she could use the knocking procedure and the experimenter would come back, but the child would then receive his/her less preferred reward.

Each subject waited in one of four display conditions: (1) both items

present in front of the subject during the waiting period, (2) preferred item present, (3) less preferred item present, or (4) neither item present. The experimenter placed the item(s) to be displayed on the table in front of the child and placed the other(s) in a cake tin, to be left beneath the table. She then repeated the contingencies and left the room. If the subject did not signal for the experimenter to return, she waited in the adjacent room for 20 minutes. During the waiting period, the experimenter recorded the subject's behaviors within each 60 second interval. After the subject signaled or 20 minutes had passed, the experimenter returned to the room and gave the child the appropriate reward. Each subject was then given a few minutes in which to eat or play with his/her reward before being taken back to the classroom.

Results

The processes governing the initial decision between the delayed and immediately available outcomes may be qualitatively different from those responsible for the maintenance of waiting once it has been chosen. Since this study focuses on delay-sustaining processes, the analyses reported here include only the data of subjects who exhibited at least minimal waiting behavior, i.e., did not take the less preferred item immediately. There were seven subjects, distributed across the conditions, who chose to terminate the session immediately; thus, analyses were performed on the data of the remaining 57.

Continued Waiting Probability Function

The probability that a subject continues waiting (W), given previous waiting time (t), may be represented by P(W|t). Strictly speaking, "continued waiting" is an instantaneous phenomenon. Practically, however, an observer can judge that a person has continued to wait at a certain instant in time only if the person is still waiting at some point beyond that instant. Our procedure for estimating the P(W|t) function involved partitioning the 20 minute waiting period into one minute intervals. A subject was considered to have "continued waiting" at a particular moment if at the end of the next one minute interval he/she was still waiting. Thus, given a number of subjects who have waited five minutes, for example, some may continue waiting through the sixth minute while others may terminate the waiting period before the end of the sixth minute. The former group is judged to have continued waiting, given five minutes of previous waiting time. In this way, it was determined for every one minute point what proportion of the remaining subjects continued to wait, and an analysis was carried out to determine whether or not the proportion of subjects continuing to wait decreased as previous waiting time increased.

Insert Figure 1 about here

Figure 1 displays the successive values of these proportions. There is no indication that probabilities of continued waiting decline as a function of previous waiting, as the aversive affect model and the dynamics of action imply they should. In fact, there appears to be a tendency for the probability

of continued waiting to increase with time ($r(18)=.53$, $p<.05$). This relationship was exhibited whether the subject was exposed to either, both, or none of the outcomes.

Outcome Display Effects

Since the distribution of waiting times tended toward bimodality, results were obtained through the use of contingency table analyses. There were no differences in waiting behavior between subjects whose preferred outcome was food and those who preferred toys.

Insert Table 1 about here

Table 1 contains the frequencies of subjects in each display condition who either waited for the delayed outcome for the full 20 minute period or terminated their waiting early. Subjects exposed to no outcome display were relatively less inclined to terminate waiting early than were subjects exposed to at least one of the outcomes ($p<.05$, Fisher exact probability test). Thus, the data are consistent with previous indications that outcome displays induce processes that inhibit waiting behavior. The analysis provides no indication that any outcome display condition interferes with successful waiting behavior more than the other display conditions. Thus, the results do not provide support for the claims of either the aversive affect model or the dynamics of action regarding differential display effects.

Waiting Period Activities

Observations of subject behaviors during the waiting period were

recorded in one minute time intervals. Thus, only the observations for the 42 subjects who waited at least one minute were analyzed. Each activity was coded dichotomously for its occurrence or nonoccurrence during a given subject's waiting period. The resulting 2x2 contingency tables for each activity (Partial-Full Wait x Activity Occurrence-Nonoccurrence) were examined for association via Fisher exact probability tests. Subjects who waited the full delay period were much more likely to: (a) talk to themselves about things not related to the delay situation ($p<.05$), (b) yawn ($p<.001$), (c) rest their heads on their arms ($p<.05$), (d) look around at the floor of the room ($p<.005$), and (e) fidget in their chairs ($p<.05$). On the other hand, subjects who did not wait through the entire delay period were much more prone to: (a) silently tap the table in rehearsal of the signal for terminating the delay period ($p<.001$) and (b) stare at the prizes ($p<.05$). Other behavioral categories in which there were no differences between subjects who terminated early and those who waited were: (a) talking to themselves about things related to the delay situation, (b) touching the prizes, and (c) creating irrelevant games to play while waiting.

Discussion

The continued waiting probability function obtained for subjects in this study does not conform to the prediction that continued waiting should become less likely with increased previous waiting time. This prediction is implied by Mischel's model, as a result of its emphasis on the central role of frustration affect in delay processes. Thus, the intervening variable of

affect is unnecessary, and in fact unsubstantiated in its proposed capacity as a psychological process mediating delay behavior. We are not suggesting, of course, that negative affect does not exist during the waiting period, but simply that it is not the governing factor in delay. In addition, the experimental manipulation of outcome classes, to include immediate and delayed rewards of different classes, did not produce the differential display effects predicted by Birch and Atkinson. Rather, the display effects obtained were very similar to those customarily obtained using items of the same class--any outcome display interfered with successful waiting, but there were no differences among the various display conditions. This result, along with analyses of behaviors associated with successful delay, would support Mischel's suggestion that distraction aids in delay situations. The question remaining, however, is just what the subject is being distracted from, since it apparently is not aversive affect.

Traditionally, decision theorists (Fishburn, 1970, Chap. 7; Jamison, 1970) have considered the salient issue in delay choices to be a tradeoff between the value differential, i.e., the difference in attractiveness of the deferred and immediately available outcomes, and the time differential, i.e., the amount of time required for the delayed outcome to become receivable. The person faced with the delay choice has some subjective notion, though it is typically not articulated and perhaps not even conscious, concerning how great the value differential must be to offset any given time differential. Stated simply, the delayed reward must be evaluated sufficiently higher than the immediate reward to make the waiting period "worth it." Conversely, for

any particular difference in attractiveness between two items, there is a corresponding amount of time which a person is willing to wait, but beyond which the person is not willing to wait. If the required waiting period is shorter than this critical amount of time, the person should wait the full period; if it is longer, he/she should not begin waiting at all. As a result, waiting behavior should be essentially an all-or-none phenomenon, and the distribution of waiting times would be predicted to appear distinctly bimodal.

A problem arises, however, in the application of decision theoretical logic to the delay of gratification paradigm introduced by Mischel and used in this study. In this case, the subject does not know in advance how long he/she will be required to wait for his/her preferred outcome. At best, he/she can only guess how long the waiting period will be. Even so, the distribution of waiting times in this study did tend toward bimodality.

To accommodate this additional factor, i.e., uncertainty regarding the length of the delay period, we would like to propose an augmented decision model. Since the subject initially does not know how long he/she will be required to wait, he/she is forced to re-appraise his/her decision throughout the length of the waiting period. Thus, his/her initial decision to wait is conditional upon the premise that the length of the waiting period does not exceed the amount of time he/she is willing to "trade" for the given value differential. As time passes, the subject is faced with a continual series of decisions as to whether the difference in value between the two outcomes is worth the amount of time he/she has now waited.

It is at this point that the role of distraction becomes crucial. If the delay period is conceived as a series of decisions to be made, at any moment there are three alternatives available to the subject. He/she could: (1) choose to take the less preferred outcome immediately, terminating the session, (2) choose to continue waiting for the preferred outcome, or (3) do something else--in other words, ignore the fact that there is a decision to be made. If the subject begins waiting for the delayed outcome and never again recognizes the opportunity to decide, he/she delays gratification by default. Thus, distractors serve to prevent recognition of a decision-making opportunity and, as a result, decrease the probability that the subject will terminate the session. On the other hand, paying attention to the rewards and behaviors like practicing the termination signal should lead to shorter waiting times, since they remind the subject of the decision to be made. These, in fact, were the results obtained in this study--conditions in which rewards were present led to less successful delay than the one in which rewards were absent, and behaviors reminding the subject of the decision to be made were associated with unsuccessful delay. Additional evidence for this position is found in the results of a study by Corfield, Al-Issa, and Johnson (1976). They asked each subject to work a crossword puzzle while waiting for a delayed reward. For half the subjects the words making up the puzzle were relevant to the awaited reward, whereas for the other half they were irrelevant. For groups whose reward was not contingent on the work they did, as is generally the case in Mischel's paradigm, subjects waited significantly longer when puzzle words were irrelevant to the outcomes in the delay

situation. Here again, the irrelevant puzzle could serve to distract the subject from the decision to be made. The relevant puzzle, however, would serve as a reminder of the decision to be made, and decrease the subject's chances of waiting.

The augmented decision model provides an explanation of the results of the present study, which are incompatible with other current theories. In addition, it accounts for the facilitative effect of distraction during the delay period, a stable finding from previous studies as well as the current one. Our conception of the waiting period as a series of decision-making opportunities, in which successive re-appraisals of the time vs. value trade-off are made, is also supported by the work of Miller and Karniol (Note 1). Whereas our focus has been on the change in time elapsed as the salient feature in re-appraisals, Miller and Karniol provide evidence that subject's may also re-evaluate the value differential during the waiting period. Conditions leading to a devaluation of the preferred reward, and thus a decrease in the value differential between the two items, were also found to decrease delay times. This result is fully consistent with and, in fact, supportive of the augmented decision model. It follows from the model that if the value differential is perceived to decrease then the amount of time the subject is willing to wait to receive the preferred outcome will decrease, and this was exactly the result obtained. Thus, the augmented decision model appears to offer a reasonable interpretation of delay processes on the basis of the evidence available to date, and warrants further investigation through direct tests.

Reference Note

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Footnotes

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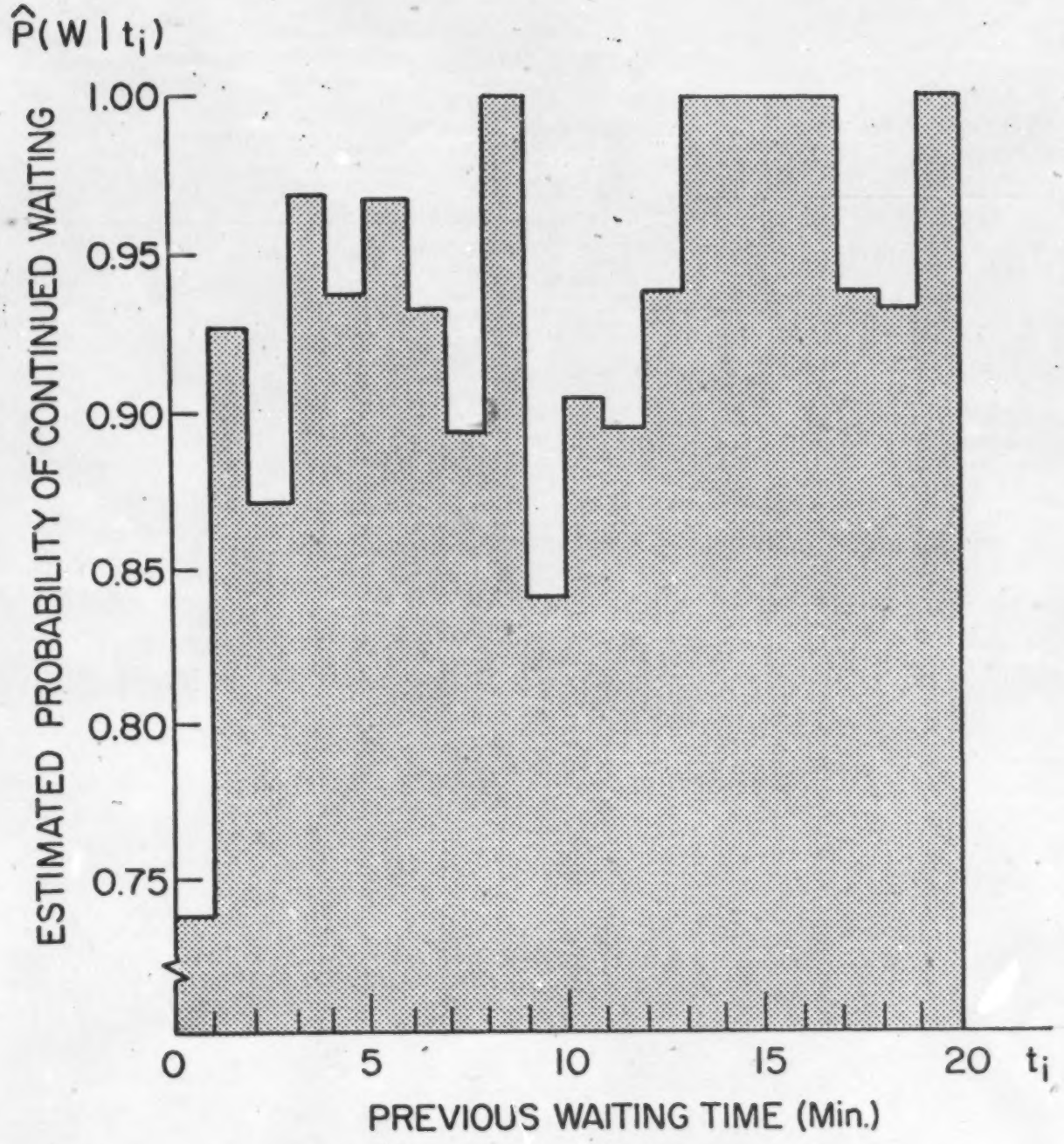
Table 1

Frequencies of Categories of Waiting Behavior by Display Condition

	Waiting	
Displayed Outcome	Partial	Full
Immediate	12	3
Delayed	12	2
Both	12	3
Neither	7	6

Figure Caption

Figure 1. Estimates of the probability of continued waiting as a function of previous waiting time.


$\hat{P}(W \mid t_i)$
ESTIMATED PROBABILITY OF CONTINUED WAITING
1.00
0.95
0.90
0.85
0.80
0.75
0
5
10
15
20
t_i
PREVIOUS WAITING TIME (Min.)